CLAIMS

I claim:

1. A process for noise reduction from noisy data representing an artifact at sample points in two dimensional space of a specimen comprising the steps of:

receiving said noisy data as a vector, each element of which corresponds to one sample point; and

calculating coefficients of a polynomial which converts said noisy data vector to a two dimensional function continuously representing the artifact in the two dimensional space.

2. The process of claim 1 wherein said sample points lack regular geometrically proscribed locations on said specimen.

3. The process of claim 1 wherein said specimen is a non-rectilinear specimen.

4. The process of claim 1 wherein the sample points have a sufficiency to represent the special frequency of the noise to be reduced.

5. The process of claim 1 wherein said polynomial is a Zernike polynomial.

6. The process of claim 1 wherein said calculated coefficients are fewer in number than the number of sample points.

7. The process of claim 1 wherein said noisy data is obtained using a measuring apparatus and wherein said calculating step includes the step of mathematically multiplying said data vector by a matrix representing a least squares fit between said data vector and the polynomial.

8. The process of claim 7 wherein said matrix is a single value decomposition of said two dimensional space as applied to said apparatus.

9. The process of claims 1 further comprising the step of calculating specimen spatial artifacts from said polynomial for one or more points in said two dimensional space.

10. The process of claim 9 further comprising the step of transmitting said coefficients to a remote location prior to the calculation of spacial artifacts from said polynomial.

11. A process for the generating a noise correcting matrix for a measurement apparatus comprising:

receiving data representative of artifacts in two dimensional space of a specimen obtained by said apparatus, each data point associated with a data position; and

calculating a specimen-independent noise compensating matrix as a function said data position in two dimensional space on said specimen.

12. The process of claim 11 wherein said calculating step applies least squares fit analysis.

13. The process of claim 11 wherein said matrix is of the form of a multiplier of Zernike polynomial decomposition coefficients.

14. An apparatus for noise reduction from noisy data representing an artifact at sample points in two dimensional space of a specimen comprising:

means for receiving said noisy data as a vector, each element of which corresponds to one sample point; and

means for calculating coefficients of a polynomial which converts said noisy data vector to a two dimensional function continuously representing the artifact in the two dimensional space.

15. The apparatus of claim 14 wherein said specimen is a non-rectilinear specimen.

16. The apparatus of claim 14 wherein the sample points have a sufficiency to represent the spacial frequency of the noise to be reduced.

17. The apparatus of claim 14 wherein said polynomial is a Zernike polynomial.

18. The apparatus of claim 14 wherein said calculated coefficients are fewer in number than the number of data points.

19. The apparatus of claim 14 wherein said noisy data is obtained using a measuring apparatus and wherein said calculating means includes means for mathematically multiplying said data vector by a matrix representing a least squares fit between the data vector and the polynomial.

20. The apparatus of claim 19 wherein said matrix is a single value decomposition of said two dimensional space as applied to said measuring apparatus.

21. The apparatus of claim 14 further comprising means for calculating specimen spatial artifacts from said polynomial for one or more points in said two dimensional space.

22. The apparatus of claim 21 further comprising means for transmitting said coefficients to a remote location prior to the calculation of spatial artifacts from said polynomial.

23. Apparatus for generating a noise correcting matrix for a measurement apparatus comprising:

means for receiving data representative of artifacts in two dimensional space of a specimen obtained by said apparatus, each data point assocated with a data position; and

means for calculating a specimen-independent noise compensating matrix as a function of data position in two dimensional space on said specimen.

24. The apparatus of claim 23 wherein said calculating means applies least squares fit analysis.

25. The apparatus of claim 23 wherein said matrix is of the form of a multiplier of a Zernike polynomial without decomposition coefficients.

26. The apparatus of claim 14 wherein said means for calculating coefficients is a computer.

27. A model-based method of wafer shape reconstruction comprising:

obtaining a set of noisy data points representing the wafer shape;

using a complete set of Zernike polynomials as a shape functional space;

applying a weighted least square fit between said noisy data points and a set of data points calculated from said Zernike polynomials; and

finding decomposition coefficients for said wafer shape.

28. The model-based method of claim 27 wherein said decomposition coefficients are a compact wafer shape data representation.

29. The model-based method of claim 27 wherein said set of noisy data points form a scanning pattern that is not necessarily evenly spaced.

30. The apparatus of claim 14, wherein said sample points lack regular geometrically proscribed locations on said specimen.

5